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GEOPHYSICS.—*Comagmatic regions and the Wegener hypothesis.*[1]
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In the many discussions of Wegener's hypothesis of sliding continents one factor in the problem and a possible test of the correctness of his ideas seems to have been somewhat neglected. This is the matching of materials at the edges of the pieces in the jig-saw puzzle—whether they would fit well together, not in outline but in the character of the crustal material, if the parts were slid back into their original positions.

Wegener lays some stress on what he considers to be tectonic accordances, such as, along the Atlantic break, those of the Algonkian gneiss ranges of Scotland and of Labrador, the supposed continuation of the Caledonian fold in Newfoundland, and others. Lake[2] has recently pointed out that these supposed accordances are forced and that they can be made to agree only by great and unwarranted distortions. Wegener attempts also some stratigraphic and biological accordances and alludes to the extension of the plateau basalts of East Greenland over Jan Mayen, Iceland, and the Faroe Islands, and to a supposed correspondence between the Deccan Traps of India and basalts of northern Madagascar.

The object of the present note is to examine the question of petrographic accordances, chiefly along both sides of the Atlantic basin, in the light of what is known of the bordering comagmatic regions. Such a region is, by definition, one of cognate igneous rocks, that resemble each other in their general mineral and chemical characters and in their petrographic features. In any area these igneous rocks form the foundation of the surficial and tectonic features; they form

[1] Received July 23, 1923.
[2] P. S. Lake, Geogr. Journ. **56**. 1923.

the main portion of the continental raft, so to speak, which, according to Wegener, drifted across the space now occupied by the Atlantic, bearing a load of sedimentary deposits the surface of which is corrugated or otherwise roughened by mountain building, warping, erosion, and other such dynamical and structural processes. The effects of these processes do not extend to the whole depth of the crystalline igneous sheet. If, therefore, the crack or line of disjunction ran through such a region of chemically and petrographically similar, igneous rocks, we should find on either side of the gap areas of corresponding igneous rocks derived from the basement, even though the sedimentary rocks and the fossils and other stratigraphic features might not be accordant because of surficial changes that may have taken place later than the separation. The following brief discussion is based on the second edition of Wegener's book.[3] Because of the preliminary character of this paper the various statements and descriptions must be put very briefly and only the chief petrographic features can be given. Nearly all references must be omitted. The reader will find most of the data in Iddings' Igneous Rocks, Vol. II, and in Professional Paper No. 99 of the U. S. Geological Survey.

The beginning of the Atlantic split and sliding is supposed to have been in late Cretaceous or early Tertiary time, but it seems reasonable to believe that the time element has little bearing on the phase of the matter that is now under discussion. We are dealing here with the deep-lying igneous basement, as has been said, beneath the relatively very thin skin of sedimentary rocks which record the passage of time by their content in fossils and their very shallow movements. Beneath these the basal masses of igneous material, whether solidified or as liquid "magma reservoirs," must persist in their general characters during and in spite of the epidermal movements above them, the sense of which is up and down or radial for the most part. It may be supposed that the crystalline part of the "crust" which we shall here consider may, at a rough estimate, extend to about 20 miles beneath the surface, possibly rather more according to some estimates.[4]

In considering the Atlantic split let us begin at the northern end, where it is narrowest. Here, according to Wegener's maps, the northwest coast of Norway was jammed against the southeast coast of Greenland, with Iceland squeezed in between the two. We may leave out of consideration the pre-Cambrian gneisses and schists, which belong to the Scandinavian shield. Along the Norwegian coast is much

[3] Alfred Wegener, *Die Entstehung der Kontinente und Ozeane*, Braunschweig, 1920.

[4] Cf. R. A. Daly, *The earth's crust and its stability*, Am. Journ. Sci. **5**: 360–363. 1923.

granite, with some distinctly sodic syenite and some gabbro, and there are several important areas of anorthosite and related rocks as at Bergen. On the east coast of Greenland, as far north as Scoresby Sound, besides the pre-Cambrian gneisses and granites, the rocks are mostly plateau flows of basalt of Tertiary age, which overlie the gneiss, but the extensive Paleozoic granites and syenites, and especially the characteristic anorthosites such as are found in Norway, are very rare or are lacking entirely. Some small areas of rather alkalic rock occur also along the east coast of Greenland, for which there seems to be no corresponding areas in Western Norway, unless possibly the Christiania region around the corner may be so reckoned. Of the plutonic basement of Iceland little or nothing seems to be known. It thus appears that Western Norway and Eastern Greenland do not show signs of correspondence.

On the west coast of Greenland the igneous rocks seem to be mostly dioritic, with here also extensive flows of basalt and several noteworthy areas of highly sodic and very peculiar rocks. Somewhat similar dioritic rocks occur on Ellesmere Land, which is virtually a northwesterly continuation of the west coast of Greenland. But in Baffin Land, which is separated from Greenland by the wide and rather deep Baffin Bay and Davis Strait, similar rocks do not appear to occur, although little is known of the petrography of this region. A large series of rocks mostly from the western and southern parts of Baffin Land, brought back by the McMillan Expedition and entrusted to me for study, are mostly granitic and gneissoid, and evidently belong to the Canadian Shield. No areas of alkalic rocks, corresponding to those of Julianehaab, Ivigtut, etc., and no extensive basalt flows are known from eastern Baffin Land. The evidence therefore, although it is imperfect, is adverse to the idea that Baffin Land was once contiguous with the west coast of Greenland, as has been suggested by Taylor and by Wegener.

In discussing this northern end of the Atlantic split it should be said that the very extensive area of the Tertiary plateau basalts, which are remnants of a land that then covered all the region from eastern (and possibly western) Greenland to the Faroes and Franz Josef Land, which has been called the Thulean region, is evidence that underlying this is a supply of magma of very uniform basaltic composition. The outpouring of these basalt flows is later than the Wegenerian fracture and it might be plausibly argued by a follower of Wegener that they originated in and thus represent the viscous basaltic substratum on which the raft of crystalline crust floated west-

ward, and that the magma was able to come to the surface because of the freedom from pressure brought about by the laying bare of the surface of the lower basaltic layer. This is plausible and ingenious, but it was shown by Geikie, in his work on the ancient volcanoes of Great Britian, that similar lavas were being poured out in the Thulean region as far back as Paleozoic and even pre-Cambrian time. We know also that similar enormous floods of plateau basalts were being poured out elsewhere, as in India, Siberia, and in the northwestern United States, at approximately the same time as those of the Thulean region, and that these other outflows can not be connected with relief of pressure due to sliding of the upper parts of the crust. The Thulean basalts must then be regarded as indecisive.

Farther south we find, according to Wegener's maps, Ireland and Great Britain abutting against Labrador and Newfoundland, and (presumably) France, with the Armorican peninsula, alongside of the Maritime Provinces and New England. An outstanding petrographic feature of Labrador and Newfoundland and eastern Canada is the presence of many large areas of pre-Cambrian anorthosite. Nothing corresponding to them occurs in western Europe, at least in the parts that would correspond with the American occurrences on the Wegener hypothesis, although areas of anorthosite occur in western Norway, as we have seen, these having no corresponding representatives in Greenland. The extensive Triassic "trap sheets" of New England, Nova Scotia, and Labrador also do not have their equivalents in western Europe, except that many such basaltic rocks of various ages occur in Great Britain and Ireland. It is to be noted, moreover, that these more northerly occurrences of Triassic traps in America are but the end members of a long series of plateau extrusions which extends far down through New Jersey and Pennsylvania into the Southern States. This important petrographic feature has no counterpart across the Atlantic. Another marked petrographic feature of New England and eastern Canada is the occurrence of many small areas of decidedly sodic rocks of very early geologic age, most of them east of the Appalachians. Somewhat similar highly sodic areas are present in northern Scotland and elsewhere in the British Isles, but they do not seem to be represented in Labrador and Newfoundland opposite them. Those of the Novanglian Region may be represented by the somewhat alkalic rocks of central France, but these are of much later date and are, furthermore, much less sodic. The dominant feature of the Appalachian region, along the Atlantic coast of the United States, is the abundance of granite which is quite

uniformly characterized by being rather high in both soda and lime and rather low (for granite) in potash. Although much granite exists in the corresponding parts of western Europe it does not show the uniformity in composition that is the striking feature of the Appalachian region.

In the first edition of his book Wegener assumed that France, the Iberian Peninsula, and northwest Africa were conterminous with the southern Atlantic States and the West Indies, but in later editions they are separated by a rather narrow inland sea. The interior of the Iberian Peninsula is largely granitic, but we know practically nothing of these rocks, especially as to their chemical characters. They may or may not correspond to the granites of the Appalachian region, but the different configurations of the two masses is against such a correspondence. Several areas of highly sodic rocks occur in Spain and Portugal, but these do not have any corresponding areas in the most southerly states, South Carolina, Georgia, and Florida, which should have adjoined Portugal, although similar highly sodic areas exist many miles inland and to the west in Arkansas and Texas.

The Lesser Antilles form a region with somewhat peculiar and unusual petrologic features, the volcanic rocks showing as their chief and most notable character simultaneously high silica and lime, although the underlying plutonic igneous foundation appears to be of a more usual character. The Mexican region, to the west, is somewhat similar to the Antillean, especially in its high silica, but is rather more normal. Of the petrology of the west coast of the great African bulge or protuberance we know little, but that little, such as the abundance of basaltic and charnockitic rocks in Liberia, Senegal, and French Guinea, indicates that the eastern shore of the Atlantic in these latitudes is very different from the western.

We come now to the crucial portion of the line of fission—the northeastern corner of South America and the north and east shores of the Gulf of Guinea. The apparent exactness with which the one of these could be fitted into the other first suggested the idea of former juxtaposition and subsequent separation. Unfortunately we know comparatively little in detail of the igneous rocks of much of these two parts of the globe, but we have sufficient knowledge of their broader features to permit us to consider the correspondence or non-correspondence of the rocks as very weighty evidence.

The eastern part of the north littoral of South America, comprising the Guianas and the States of Pará, Maranhao, Ceará, and Rio

Grande do Norte,[5] forms the northern edge of the great Archean "Brazilian Complex," which consists mainly of granite and gneiss, with syenite, quartz porphyry, diabase, and gabbro, as well as various schists. There is no record of any areas of alkalic rocks along this stretch of coast, but the island of Fernando Noronha, near Cape San Roque, is composed of phonolite. The land to the north of the Gulf of Guinea, which according to Wegener formerly adjoined the north coast of South America, seems to be of rather simple petrological character, in this resembling the American counterpart.[6] The basal Archean rocks are mostly granite, but we know little of its chemical characters. There occur also various other plutonic rocks, such as diorite, gabbro, and diabase. Detailed petrographical information regarding this region is rather scanty, but a number of definite and significant facts stand out. The granites of French Guinea and Dahomey are decidedly alkalic and different from the granites of the Guianas. The distinctly sodic tendency of the Nigerian granites is shown by the presence of riebeckite and cassiterite, and tourmaline-bearing granite occurs in Southern Nigeria. In Nigeria also are Tertiary volcanic rocks, among which are phonolite, trachyte, and limburgite, and very peculiar, highly sodic lavas, including nephelinite, leucitite, and hauynophyre, are found at the Etinde Volcano near the coast of British Kamerun. This littoral region has a decidedly sodic tendency, quite distinct from that of northeastern South America, and appears to be connected with a similarly sodic region to the north about Lake Chad and Sokoto. Another feature of this region which is not found in the American one is the comparative abundance of rocks of the "charnockite series" in the Ivory coast, French Guinea, and Liberia. These rocks are characterized by abundant hypersthene, running from hypersthene granite to norite, and greatly resemble the charnockite series of India. It thus seems to be evident that grave petrographical and chemical discrepancies exist between the rocks of the Guiana-Ceará coast and that of Guinea.

The igneous rocks of the eastern coastal states of Brazil, from Parahyba to Paraná, belong mostly to the somewhat monotonous Brazilian complex, and are largely granitic, with some syenite and pyroxenite (as in Bahia) and dikes of diabase. At various points near the coast, in southern Bahia, Minas Gerães, Rio de Janeiro, São Paulo,

[5] Cf. J. B. Harrison, *The geology of the gold fields of British Guiana*, 1908; J. C. Branner, *Outlines of the geology of Brazil*, Bull. Geol. Soc. Amer. **30**: 190–337. 1919, with a geologic map.

[6] For some account of the British portions of this region see F. R. C. Reed, *The geology of the British Empire*, London, 1921, pp. 140–155.

and probably in Espirito Santo, highly sodic rocks occur, including trachyte, phonolite, tinguaite, limburgite, jacupirangite, and nephelite syenite. The rather extensive occurrence of monazite sands along the coasts of Bahia[7] and Espirito Santo indicates the presence of sodic syenitic rocks in the hinterland. The islet of Trindade, about 1300 kilometers east of the coast, is composed of phonolite, according to Branner;[8] this occurrence is probably comagmatically connected with that of phonolite at the Island of Fernando Noronha off Cape San Roque. South of Brazil phonolitic rocks occur in Paraguay and possibly in Uruguay and eastern Argentina. The occurrence of vast sheets of plateau basalt in Paraná and other southern states of Brazil and in Argentina will be discussed later.

Along the west coast of Africa, south of Guinea, and opposite Brazil, Uruguay, and northern Argentina, the dominant igneous rocks appear to be mostly granitic and gneissose, belonging to the African "fundamental complex." Although comparatively little is known of this stretch of coast yet here and there some occurrences of possibly significant rocks are known. Thus, trachyte, phonolite, and trachydolerite are found on the island of São Thomé and they are also probably represented on Fernando Poo, where the lavas are mostly basaltic. These islands lie in the Bight of Biafra at the northeast angle of the Gulf of Guinea where Cape San Roque would fit in. Sodic lavas, aegirite trachyte, phonolite, and nephelinite, occur in Angola, as well as a series of sodic plutonic rocks, including nephelite syenite and shonkinite. Representatives of a fairly well-defined charnockite series, ranging from hypersthene granite to norite, are met with in Benguela. Neither sodic nor charnockitic rocks seem to have been found farther south in the Southwest Africa Protectorate. In the Transvaal there are large areas of nephelite syenite and other sodic rocks described by Brouwer, Shand, and others; but these would appear to belong to the Indian Ocean region rather than to that of the Atlantic.

There are thus found on both sides of the Atlantic, southward from Cape San Roque on the west and from the Bight of Biafra on the east, lines of isolated occurrences of sodic rocks, both plutonic and volcanic, which have been intruded into or poured out over continental basement complexes of apparently quite similar granitic and gneissose rocks. Alkalic, chiefly sodic, rocks occur also in the intervening Atlantic, as at Fernando Noronha and Trindade near Brazil and at Ascension and St. Helena in the southeastern Atlantic. This corre-

[7] I found monazite sand at a bathing beach near the city of Bahia, but observed no syenite in the prevailingly diabasic rocks of the neighborhood.

[8] J. C. Branner, Bull. Geol. Soc. Amer. 30: 300. 1919.

spondence in occurrence of coastal sodic rocks on both sides might be considered favorable to the Wegener hypothesis, but on the other hand the generally markedly sodic character of the South Atlantic islands may be interpreted with equal plausibility as indicating a generally sodic character for the magmas that underlie the South Atlantic basin and that the coastal occurrences are but marginal effusions from this. The lack of correspondence between the Guiana-Ceará coast and that of Guinea, sodic rocks being absent from the one and quite abundant in the other, seems to constitute more positive and more decisive evidence against the hypothesis. In addition to this is the rather frequent occurrence of charnockitic rocks along the African side of the Atlantic and their absence from the American side. The balance of the petrographical evidence, may, then, be regarded as adverse to Wegener's hypothesis.

Before leaving the southern part of the Atlantic split another feature should be considered. In the Transvaal and Cape Colony, and extending north into Rhodesia, enormous areas are covered with the plateau basalts of the late or post-Karroo (Triassic) Stormberg or Drakensberg series, and what are probably analogous plateau flows of about the same age are found in the Kaokoveld, near the coast, in northwestern ex-German Southwest Africa. Across the South Atlantic, in the states of Paraná, São Paulo, Santa Catarina, and Rio Grande do Sul in Brazil, in Uruguay, and in southern Argentina (Patagonia), enormous areas are covered with similar plateau basalts of generally Triassic age. These vast flows have not been sufficiently studied, as yet, to permit any detailed chemical or petrographical correlation. But their occurrence as a petrographical feature of the first magnitude common to both sides of the South Atlantic is of great interest and is apparently favorable to the Wegener hypothesis. To judge from their geologic age they would seem to have been extruded on both sides, in general, shortly before the beginning of the split, if I understand Wegener correctly. If his hypothesis be true, however, we would expect, on the analogy of the Thulean basaltic area of the North Atlantic, to find many basaltic islands in the ocean between the two sides of the fracture, because of the relief of pressure and exposure of the underlying basaltic substratum brought about by the westward sliding of the American continental mass. This, however, is not the case. There are very few islands in the South Atlantic and these show dominantly sodic and not sodi-calcic (basaltic) characters. These vast plateau extrusions of probably similar basalts in South Africa and in southern South America seem to me more justifiably interpreted as belonging to a general and widespread event or cyclical incident in the earth's history, strictly analogous

to the similar plateau basalt areas of the Deccan, Thulean, Oregonian, Palisadan, and Siberian regions.[9]

In this preliminary sketch of the relation of various comagmatic regions to the main features of the Atlantic area, expecially as regards the Wegener hypothesis, it seems to be scarcely necessary to discuss the relations in other parts of the earth (Lemuria, for example) mentioned by Wegener in the course of his discussions. Mention may be made, however, of a minor point in Wegener's argument.[10] This is that he believes that the Pacific volcanic islands are "fragments of the lithosphere and that they are in so many cases so completely covered with lava that the lithospheric core is not visible." Were this true the upper side of the basal fragment of the lithosphere should be not far below or at the surface of the ocean and we would expect to find, as we do at many other volcanoes, fragments of granite, gneiss, or other basement rocks as inclusions in the lavas.

In the course of a recent study of the lavas of the Hawaiian islands a very large number of specimens have been examined but not a single inclusion of such igneous or metamorphic rocks, or of limestones or sandstones, has been found. The only xenoliths that the Hawaiian lavas contain are of dunite, lherzolite, pyroxenite, or gabbro—all evidently cognate inclusions (enclaves homoeogènes of Lacroix) produced by magmatic segregation in the basalts. Lacroix[11] has recently shown that the supposed granite of Bora-Bora in the Society Islands is a medium-grained olivine gabbro, either intrusive into the abundant basalts of the island or (as seems to me to be more probable) a cognate inclusion like those of the Hawaiian Islands. A somewhat extensive search through the literature on the petrography of the volcanic islands of the Pacific has not revealed any example of inclusions of granitic or other continental rocks. Wegener's suggestion may therefore be regarded as unsupported by evidence.

ZOOLOGY.—Gonorhynchus moseleyi, *a new species of herring-like fish from Honolulu.* DAVID STARR JORDAN AND JOHN OTTERBEIN SNYDER.

Gonorhynchus moseleyi Jordan and Snyder, new species

Description of the type, No. 23239, Stanford University collection, a specimen 140 millimeters long from Honolulu, T. H., collected by Edwin Lincoln Moseley, professor of Biology in the State Normal School at Bowling Green, Ohio.

[9] H. S. Washington, *Deccan traps and other plateau basalts*, Bull. Geol. Soc. Amer. **33**: 765. 1922.

[10] A. Wegener, *Die. Entstehung der Kontinente und Ozeane*, 2 ed., 1920, p. 42, note 1.

[11] Lacroix, *Le soi-disant granite (gabbro à olivine)* de *l'île Bora-Bora*, C. R. Soc. Géol. France, 1916, p. 178.

Head 4.1 in length to base of caudal; depth 9.2; depth caudal peduncle 4.5 in head; depth head 2.6; length snout 2.5; diameter eye 4; width interorbital space 3.7; length pectoral fin 1.3; ventral fin 2.2; height dorsal 2.1; anal 2.4; length caudal 1.8; scales lateral series to base of caudal 166; vertical series between lateral line and middle of back 22; pectoral rays 11; dorsal 9; ventral 9; anal 7.

Length of barbel equal to diameter of pupil, extending when depressed over half way between its base and border of lower lip. Upper lip with many rows of tubercles, the edge fringed with papillae. Lower lip covered with small tubercles and with pendent lobes which extend posteriorly.

Gillrakers long and slender 17 plus 19 on the first arch.

Head and body almost completely scaled, the scales extending over throat to edge of lip, under part of snout, and along the rays of all the fins. Tip of snout, lips, and opercular membrane naked. The scales are long and slender with 9 spines on the exposed ends.

Pectoral and ventral fins with pointed axillary flaps over half as long as the fins; the outer surfaces of which are covered with scales. Pectoral fins pointed, appearing acute when depressed, ventrals rounded, edge of dorsal convex on the anterior, concave on the posterior half, caudal notched.

Color in spirits gray above, lighter below, the dark color resulting from numerous closely opposed black specks. Pectoral fins largely black, bordered by white; dorsal and caudal broadly edged with black, ventrals black, edged with white, the dark area appearing as a well defined black oval spot when the fin is not spread; anal immaculate. Lining of gill chamber black, the color showing through the translucent opercle. The bases of pectorals and ventrals were bright yellow when the specimen was fresh.

This dainty little fish was found by Moseley in the market of Honolulu, where he made a valuable and interesting collection of fishes.

It is closely related to the two known species of the genus, *Gonorhynchus gonorhynchus* (Gmelin) from the Indian-Australian region and *Gonorhynchus abbreviatus* Schlegel from Japan.

The Hawaiian species differs from both these in having a much larger eye and a longer head. The color of the ventral fins differs also, those of *G. moseleyi* having a large sharply defined central oval black blotch, not covering the posterior part of the fin as in the others.

Comparisons follow with *Gonorhynchus gonorhynchus* from Port Jackson and Lord Howe Islands and *G. abbreviatus* from Yokohama.

	HAWAII (*G. moseleyi*)	LORD HOWE ISLAND *G. gonorhynchus*		PORT JACKSON *G. gonorhynchus*	YOKOHAMA *G. abbreviatus*
Length to base of caudal in millimeters	124	122	89	217	250
Depth body in hundredths of length	0.11	0.11	0.10	0.115	0.125
Depth caudal peduncle	0.058	0.05	0.05	0.058	0.056
Length head	0.26	0.245	0.24	0.21	0.22
Length snout	0.10	0.095	0.098	0.08	0.095
Diameter eye	0.065	0.05	0.05	0.045	0.05
Width interorbital area (skull)	0.035	0.025	0.023	0.03	0.035
Dorsal rays	9	10	10	11	8
Anal rays	7	7	7	7	6
Pectoral rays	11	10	9	10	11
Ventral rays	9	9	9	9	8

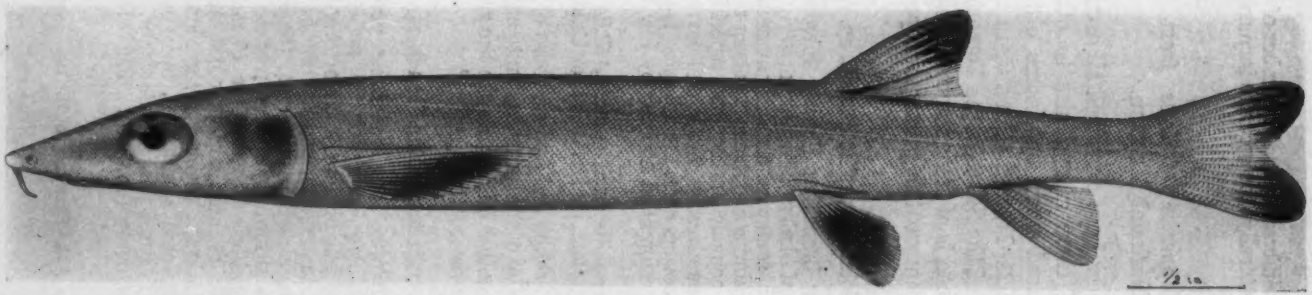


Fig. 1. Gonorhynchus moseleyi Jordan and Snyder

There appear to be no differences in the number of the scales. With age, the scales seem to grow laterally, the spinules increasing in number to 19 or more.

BOTANY.—*Ten new species of trees from Salvador.*[1] PAUL C. STANDLEY, U. S. National Museum.

The ten species of trees here described all occur in the Republic of Salvador, but some of them extend also to other parts of Central America. Part are based upon specimens obtained by the writer during the winter of 1921–22, and others upon material collected by Dr. Salvador Calderón of the Salvadorean Department of Agriculture. One of the three described is of some importance locally as a source of lumber, while another represents a genus not reported previously from North America.

Pseudolmedia mollis Standl., sp. nov.

Large tree, the young branchlets densely fulvous-pilose; petioles very thick, 4 to 6 mm. long; leaf blades oblong or narrowly ovate-oblong, 11 to 16 cm. long, 4 to 6.5 cm. wide, somewhat abruptly acuminate, obliquely rounded at base, subcoriaceous, glabrate above except along the nerves, the venation depressed, beneath paler, copiously soft-pilose, especially along the costa and lateral nerves, the venation elevated, the lateral nerves about 15 pairs, arcuately ascending, anastomosing near the margin; fruit globose-oval, 2 cm. long, densely soft-pilose, subtended at base by few broadly ovate, acutish bracts.

Type in the U. S. National Herbarium, no. 1,152,341, collected at Comasagua, Salvador, December, 1922, by Dr. Salvador Calderón (no. 1382).

The leaves resemble in shape and texture those of *P. oxyphyllaria* Donn. Smith, the only other species of the genus known to occur in Central America, but the pubescence is altogether different in the two species. The vernacular name of the Salvadorean tree is "tepeujushte."

Ledenbergia macrantha Standl., sp. nov.

Tree, about 6 m. high, with long, somewhat pendent branches; young branchlets sparsely tomentulose, soon glabrate; petioles slender, 2 to 4.5 cm. long, sparsely villosulous; leaf blades elliptic or broadly ovate, 4.5 to 8 cm. long, 2.5 to 4.5 cm. wide, acuminate, acute or obtuse at base, thin, glabrous above, beneath villosulous along the costa near the base, elsewhere glabrous racemes very numerous and forming a dense panicle, their rachises 12 to 20 cm. long, tomentulose; pedicels filiform, 5 to 10 mm. long; sepals oblong-oblanceolate, in fruit 8 to 13 mm. long, 3 to 4.5 mm. wide, glabrate, conspicuously veined; fruit glabrate, rugulose, 3 mm. long.

Type in the U. S. National Herbarium, no. 1,111,202, collected along roadside at Puerta de la Laguna, near San Salvador, Salvador, February 24, 1923, by Dr. Salvador Calderón (no. 680). The following additional specimens have been seen:

[1] Published by permission of the Secretary of the Smithsonian Institution.

SALVADOR: Puerta de la Laguna, *Standley* 23656; April 27, 1922, *Calderón* 680 (both these collections are from the type tree). Department of Ahuachapán, *Padilla* 195.

Dr. Padilla gives the vernacular name as "nevado."

Until very recently, only a single species of *Ledenbergia* was known, *L. seguieriodes* Klotzsch of Venezuela. During the present year there has been published a second species, *L. peruviana* O. C. Schmidt, of Peru. The Salvadorean tree differs from the South American ones in having flowers twice as large as theirs.

Hyperbaena phanerophlebia Standl., sp. nov.

Tree, 4.5 to 7.5 m. high, with dense crown, glabrous throughout; petioles rather slender, 1 to 2.5 cm. long; leaf blades narrowly oblong or oblong-lanceolate, 9 to 21 cm. long, 3 to 7 cm. wide, narrowed to an obtuse apex, obtuse or acute at base, thick and coriaceous, lustrous, triplinerved from near the base, the costa salient on both surfaces, the lateral nerves scarcely elevated above but conspicuous beneath, about 5 pairs, arcuately and irregularly ascending, the lower surface slightly paler than the upper and finely reticulate; fruit subglobose, orange-yellow, about 2.5 cm. in diameter.

Type in the U. S. National Herbarium, no. 1,138,730, collected in a coffee plantation in the hills south of Santa Tecla, Salvador, altitude about 900 meters, April 10, 1922, by Paul C. Standley (no. 23025). Also collected in moist forest near Santa Tecla upon the same date, *Standley* 23014.

This is not closely related to any of the species of *Hyperbaena* previously reported from Central America.

Rollinia rensoniana Standl., sp. nov.

Tree, about 6 m. high, the young branchlets thinly villous-tomentose; petioles 6 to 12 mm. long; leaf blades elliptic-oblong, 12 to 23 cm. long, 5 to 8 cm. wide, acute to long-acuminate, rounded or obtuse at base, thin, above tomentulose when young but in age glabrate, beneath densely tomentose at first with brownish and whitish hairs, in age soft-pilose with short spreading hairs, the lateral nerves 15 to 21 pairs, prominent beneath; flowers solitary or geminate, densely covered with a brownish feltlike tomentum, the pedicels 1 to 2 cm. long, becoming much longer after anthesis; sepals broadly rounded-ovate, abruptly short-acuminate; corolla lobes laterally compressed, obovate-oval, 10 to 13 mm. long, 7 to 9 mm. wide, broadened toward the apex and rounded, divaricate or slightly ascending; very immature fruit tomentose, subglobose, composed of numerous carpels with rounded tips.

Type in the U. S. National Herbarium, no. 1,138,729, collected along roadside at Santa Tecla, Salvador, altitude about 900 meters, April 10, 1922, by Paul C. Standley (no. 23033). The following additional specimens have been examined:

SALVADOR: Ateos, *Standley* 23045. Izalco, *Standley* 21866; *Pittier* 1964.

Rollinia rensoniana seems to be rather common in the uplands of central and western Salvador, but I was not able to learn anything of its fruit or of the vernacular names applied to it. Only two other species have been reported from Central America, *R. jimenezii* and *R. pittieri*, both described by Dr. W. E. Safford. Neither of those species has the abundant spreading pubescence that characterizes the Salvadorean tree.

The species is named for Dr. Carlos Renson, of the Chemical Laboratories of the Department of Agriculture of Salvador, who, during many years residence in that country, has made important contributions to our knowledge of its botanical features.

Inga calderoni Standl., sp. nov.

Young branchlets densely pilose with short fulvous hairs; leaf rachis 5.5 to 9 cm. long, narrowly winged, densely short-pilose; leaflets 5 or 6 pairs, narrowly oblong-lanceolate, 7 to 10.5 cm. long, 1.5 to 2.2 cm. wide, long-attenuate, obliquely obtuse or rounded at base, copiously fulvous-pilose above with subappressed hairs, beneath more densely pilose with mostly spreading hairs; legume oval-quadrate, 5 cm. long, 3.5 cm. wide, strongly compressed, nearly 1 cm. thick, covered with a dense feltlike tomentum of stiff fulvous hairs.

Type in the U. S. National Herbarium, no. 1,152,344, collected at Comasagua, Salvador, December, 1922, by Dr. Salvador Calderón (no. 1392).

The form of the fruit is quite unlike that of any other species of *Inga* known from Central America. The vernacular name is "pepeto de mico."

Cupania mollis Standl., sp. nov.

Branchlets subterete, finely tomentose, somewhat striate, glabrate in age; leaves abruptly pinnate, the rachis and petiole together about 23 cm. long, finely tomentose; leaflets about 14, oblong or elliptic-oblong, 8 to 13 cm. long, 3.5 to 5 cm. wide, obtuse, rounded or obtuse at base, on petiolules 3 to 8 mm. long, serrate with low appressed teeth, entire toward the base, glabrate above, beneath paler, densely velvety-pilosulous with short spreading hairs; panicles axillary, long-pedunculate, many-flowered, the branches finely tomentose; flowers sessile or nearly so; capsule glabrous without and within, subclavate-trigonous, narrowed below into a stout stipe 5 to 6 mm. long, the body obtusely angulate, 12 to 15 mm. in diameter, rounded and apiculate at apex, the partition walls thin.

Type in the U. S. National Herbarium, no. 1,152,345, collected at Comasagua, Salvador, December, 1922, by Dr. Salvador Calderón (no. 1400).

The fruit is similar to that of *C. glabra* Swartz, but the pubescence of the leaves is altogether different. The vernacular name is "cola de pavo," a name applied to various other trees of the family Sapindaceae.

Karwinskia calderoni Standl., sp. nov.

Shrub or tree, 2 to 12 m. high, glabrous throughout; petioles 7 to 12 mm. long; leaf blades lance-oblong or sometimes oblong-ovate, 3.5 to 10 cm. long, 1.5 to 3.5 cm. wide, rounded at base, acute to long-acuminate at apex, green above, pale beneath, the lateral nerves 7 to 14 pairs, elevated beneath; peduncles sometimes 6 mm. long but usually much shorter, often bifurcate above the middle, each branch bearing a few-flowered umbel, the pedicels 1.5 to 4 mm. long; flowers 3 to 4 mm. broad; fruit subglobose, black and lustrous, 6 to 7 mm. long.

Type in the U. S. National Herbarium, no. 1,151,861, collected at Aculhuaca, one of the suburbs of San Salvador, Salvador, July 14, 1922, by Dr. Salvador Calderón (no. 900). The following additional specimens have been examined:

GUATEMALA: Estanzuela, Dept. Santa Rosa, *Heyde & Lux* 3954. Berberena, Dept. Santa Rosa, *Heyde & Lux* 6088. Without locality, *Heyde* 192. Gualán, *Kellerman* 5610.

SALVADOR: Tonacatepeque, *Calderón* 214; *Standley* 19467. San Salvador, *Standley* 19118, 23544; *Calderón* 420. Armenia, *Standley* 23451. Ahuachapán, *Standley* 19901. La Libertad, *Standley* 23225. Between San Martín and Laguna de Ilopango, *Standley* 22528. La Unión, *Standley* 20650. Dept. de Ahuachapán, *Padilla* 186. Without locality, *Renson* 265. San Vicente, *Standley* 21665. Santa Ana, *Standley* 20427.

HONDURAS: Amapala, *Standley* 20697.

NICARAGUA: Aserradores Island, *Baker* 625.

Karwinskia calderoni is the only species of which I have seen Central American specimens. It is related to *K. humboldtiana* of Mexico, but is evidently distinct in the acuminate leaves and the frequently if not usually bifurcate peduncles. In Salvador it is known as "güiligüiste" or "huilihuiste," and at Ampala the name "pimientillo" was given for it. The tree is extremely abundant in the drier portions of the Pacific slope of Central America, occurring usually on dry hillsides at low or middle elevations. It is found also on the Atlantic slope of Guatemala. The wood is employed for various purposes, particularly for cart axles, railroad ties, mallets, shuttles, and fuel. Pigs are said to be paralized by eating the fruit, and similar properties are generally ascribed to the Mexican species.

Clethra vicentina Standl., sp. nov.

Tree, about 9 m. high, with dense rounded crown; young branchlets fulvous-tomentose or glabrate; petioles 7 to 15 mm. long; leaf blades oblanceolate-oblong, 8 to 12 cm. long, 2.5 to 3.5 cm. wide, obtuse, attenuate to the base, subcoriaceous, entire, green and glabrous above, covered beneath, except upon the nerves, with a very fine, close whitish tomentum; racemes numerous, 12 to 15 cm. long, the rachis slender, closely fulvous-tomentose, the pedicels slender, 3 to 5 mm. long; calyx lobes ovate-oval, 3.5 to 4 mm. long, obtuse, tomentulose; petals white, 5 to 6 mm. long, erose and ciliate; style 1.5 mm. long.

Type in the U. S. National Herbarium, no. 1,137,375, collected in moist forest on the Volcán de San Vicente, Salvador, altitude 1,500 meters, March 8, 1922, by Paul C. Standley (no. 21603).

Related, apparently, to *C. hondurensis* Britton, in which the leaves are broader and dentate, and the calyx lobes acute.

Clethra vulcanicola Standl., sp. nov.

Tree, 4.5 to 6 m. high, the young branchlets bearing a few appressed hairs but soon glabrate; petioles 7 to 12 mm. long; leaf blades oblanceolate-oblong or obovate-oblong, 9 to 12 cm. long, 2.5 to 4.5 cm. wide, acute or acuminate, acute or obtuse at base, coarsely serrate, glabrous above, green beneath and glabrous except for a few stiff, usually appressed hairs along the costa and lateral nerves; racemes 10 to 13 cm. long, the rachis fulvous-tomentose, the pedicels slender, 5 to 6 mm. long; calyx lobes 3 mm. long, ovate, obtuse, fulvous-tomentulose; capsule 6 to 7 mm. in diameter, tomentose.

Type in the U. S. National Herbarium, no. 1,138,667, collected on the rim of the crater of the Volcán de San Salvador, altitude about 1,800 meters, April 7, 1922, by Paul C. Standley (no. 22954).

Similar in general appearance to *C. alcoceri* Greenm., of Hidalgo, but in that species the pedicels are very short and the leaves are white-tomentulose beneath. *Clethra suaveolens* Turcz. is more closely related, but in that the leaves are entire. The vernacular name of *C. vulcanicola* is "zapotillo."

Avicennia bicolor Standl., sp. nov.

Tree or shrub, the young branchlets glabrous; petioles very stout, 4 to 15 mm. long; leaf blades broadly elliptic to elliptic-ovate or oval-ovate 7 to 13 cm. long, 3.5 to 7 cm. wide, rounded or obtuse at apex, obtuse at base and usually abruptly short-decurrent, glabrous and lustrous above, with prominent venation, beneath densely covered with a minute whitish tomentum; flowers spicate, opposite, the rachis elongate and the pairs of flowers distant 5 to 8 mm. from each other, the spikes numerous, forming lax panicles 5 to 17 cm. long; branches of the panicles minutely tomentose; bracts and bractlets rounded, obtuse, tomentulose; corolla 4 mm. long, the tube glabrous, the lobes obovate, subtruncate at apex, sericeous outside, glabrous within; style nearly obsolete.

Type in the U. S. National Herbarium, no. 715142, collected in mangrove swamp at Aguadulce, Province of Coclé, Panama, December 5, 1911, by H. Pittier (no. 4968). The following additional specimens have been examined:

SALVADOR: Coast of Departamento de Ahuachapán, *Padilla* 333.

PANAMA: Punta Paitilla, *Heriberto* 206.

It seems remarkable that a form so distinct as this should not have been named long ago, but it may well be that it is of somewhat rare occurrence, although the specimens cited indicate that it has a rather wide range. *Avicennia bicolor* is related to the South American *A. tomentosa* Jacq. (which has been reported from various parts of Mexico and Central America, and even from Florida, although probably erroneously), but differs in its large, broad leaves and, more conspicuously, in the distinct form of the inflorescence. In *A. tomentosa* the flowers are few and the inflorescence is short and congested.

Dr. Padilla reports that in Salvador this species is known by the vernacular name of "mangle negro."

BOTANY.—*New species of Urticaceae from Colombia.*[1] ELLSWORTH P. KILLIP, U. S. National Museum.

While on a recent expedition to Colombia for the U. S. National Museum, the Gray Herbarium, the New York Botanical Garden, and the Philadelphia Academy of Sciences, Dr. Francis W. Pennell and myself gave particular attention to the family Urticaceae, collecting about 70 numbers of this group. Most of the species here proposed as new are based upon material collected on this expedition, which clearly are not referable to any of the species contained in the comprehensive monograph of Urticaceae by Weddell,[2] or to the comparatively small number described since the publication of that work. Several other specimens collected on this expedition probably constitute new species, but in the absence of authenticated material they have not been included in the present paper.

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] In DC. Prodr. 16[1]: 32–235. 1869.

The genus *Pilea*, to which most of the following plants belong, contains over 200 species, the greater part of them occurring in the tropics of the New World. Weddell devides the genus into three main groups, *Integrifoliae*, *Heterophyllae*, and *Dentatae*. The last consists of two sections, containing those species that are glabrous, with either long or short peduncles, and those that are pubescent, with either long or short peduncles. This method of classification is followed here.

Pilea filicina Killip., sp. nov.

Plants frutescent, scandent (?), apparently dioecious, pinnately branched (branches divaricate, 10 to 20 cm. long), glabrous throughout. Stems and branches slightly angulate, faintly winged on the angles. Stipules minute, early deciduous. Leaves of a pair dissimilar and unequal, the larger ovate-orbicular, 10 to 13 mm. long, 6 to 7 mm. wide, abruptly tapering at base, sessile or subsessile, crenate at apex (2 teeth to a side, the apical tooth blunt, 2 mm. wide), otherwise entire, penninerved (4 to 6 nerves to a side, one of the pairs often conspicuous, extending to the lower of the teeth), the smaller leaves broadly orbicular, 4 to 5 mm. long, 5 to 6 mm. wide, sessile, entire or slightly undulate at apex, triplinerved; both kinds of leaves dark green (nearly black when dry) and faintly marked with linear cystoliths (especially near margin) on upper surface, paler and copiously covered with minute punctiform cystoliths beneath. Pistillate heads subglobose, minute, 1 to 1.5 mm. wide, 3 or 4-flowered, sessile or very short-petioled; perianth divisions unequal, the middle 0.8 mm. long, the lateral 0.3 mm. long; achenes broadly ovate, 1 mm. long, 0.8 mm. wide.

Type in the U. S. National Herbarium, no. 1,124,280, collected at Paime, Department of Cundinamarca, Colombia, in 1921, by Brother Ariste-Joseph (no. A927).

The venation, markings, and coloration of the leaves of this species indicate a relationship with *P. dendrophila* Miq., but the much smaller leaves, the larger kind being much rounder, and its habit of growth and branching clearly show that it is distinct. From *P. trichosanthes* Wedd., to which also it is allied, it is distinguishable by its more orbicular, nearly sessile, longer leaves which are only faintly marked with cystoliths, and by its more abundant, divaricate branches.

Pilea hazeni Killip, sp. nov.

Climbing herb, monoecious (?), glabrous throughout. Stripules ovate-orbicular, 4 mm. long, cordate at base, chartaceous, light brown. Leaves dark green above, bearing fusiform and linear cystoliths, light green beneath with more conspicuous fusiform cystoliths, 3-nerved to upper third of blade; leaves of a pair unequal and dissimilar, the larger ovate-lanceolate, 3 to 4.5 cm. long, 1.5 to 2 cm. wide, short-acuminate at apex, rounded, subcordate, or subcuneate at base, crenate-serrate (teeth averaging 9 to a side), their petioles 1 to 2 cm. long, the smaller leaves nearly orbicular in general outline, 1 to 1.8 cm. long, 1.5 to 2 cm. wide, abruptly acute at apex, rounded or subtruncate at base, crenate-serrate (teeth averaging 6 to a side), their petioles 5 to 7 mm. long. Staminate heads not seen. Pistillate heads cymose, borne in two's or three's in the axils of the upper leaves, the cymes 3 to 4 mm. wide, the peduncles 4 to 5 mm. long; achenes ovate.

Type in the U. S. National Herbarium, no. 1,140,920, collected in the forest along the Río Santa Rita, near Salento, Department of Caldas, Colombia, altitude 1,600 to 1,800 meters, August 26, 1922, by E. P. Killip and T. E. Hazen (no. 10121).

Killip & Hazen no. 9007, collected at essentially the same locality, is also of this species.

Pilea hazeni clearly should be placed in the section *Heterophyllae*, though it differs greatly from any of the described species of that group.

Pilea puracensis Killip, sp. nov.

Erect herbs, 30 to 40 cm. high, glabrous throughout. Stipules triangular-ovate, 3 mm. long. Petioles angulate, those of a pair unequal, the longer 3.5 to 5 cm. long, the shorter 2.5 to 4.5 cm. long. Leaf blades elliptic or elliptic-lanceolate, 10 to 15 cm. long, 3.5 to 6.5 cm. wide, acuminate at apex, rounded or subauriculate at base, closely crenate-serrulate to base (serrulations about 1 mm. long), 3-nerved to apex, penniveined along nerves, faintly covered on both surfaces with punctiform and linear cystoliths. Staminate inflorescence subdichotomously branched, 3 to 6 cm. long, the flowers borne in few-flowered clusters at the ends of the branches. Pistillate inflorescence of sessile, paniculately branched cymes, much shorter than the petioles; perianth-segments unequal, the middle oblong, 0.7 mm. long, the lateral orbicular, 0.2 mm. long; achenes ovate, 1 mm. long.

Type in the U. S National Herbarium, no. 1,140,081, collected in the forest at "Canaan," on the slopes of Mt. Puracé, Department of El Cauca, Colombia, altitude 3,100 to 3,300 meters, June 13, 1922, by F. W. Pennell and E. P. Killip (no. 6673).

Closely related to *P. pteropodon* Wedd., this species is distinguished by smaller leaves and smaller pistillate heads, and by the fact that its leaves do not taper into winged petioles. The foliage and general aspect of the plant suggest *P. quichensis* Donn. Smith, of Guatemala, but the staminate inflorescence is much longer and the leaves are more finely toothed.

Pilea ornatifolia Killip, sp. nov.

Plants dioecious, glabrous throughout, erect or decumbent, the branches lax. Stem succulent, geniculate at the middle of the internodes, reddish brown, without cystoliths. Stipules ovate, 2 mm. long. Leaf blades ovate, acute at apex, obliquely cordate at base, sharply serrate from base to apex, 3-nerved, (lateral nerves reaching the apex), dark green with punctiform cystoliths above, paler with conspicuous linear cystoliths beneath, penni-veined along each nerve, the veins black; leaves of a pair similar but unequal, the larger 4.5 to 5.5 cm. long, 1.5 to 2.5 cm. broad, their petioles 1 to 1.5 cm. long, the smaller 2.5 to 3.5 cm. long, 1 to 1.5 cm. broad, their petioles 2 to 3 mm. long. Staminate heads globose, about 6 mm. in diameter, densely flowered, borne on slender peduncles 2 to 2.5 cm. long; perianth violet-tinged, its lobes 0.5 mm. long. Pistillate heads 4 to 8-flowered, in short axillary cymes, borne on peduncles 4 mm. long; perianth segments subequal, about 1.2 mm. long; achenes broadly ovate, 1.5 mm. long.

Type in the U. S. National Herbarium, no. 1,140,933, collected in an open gulch in the forest on Cerro Tatamá, Department of Caldas, Colombia, altitude 3,200 to 3,400 meters, September 8 to 10, 1922, by F. W. Pennell (no. 10476).

Pilea ornatifolia is allied to *P. flexuosa* Wedd., the principal points of difference being smaller and proportionately narrower leaves of *P. ornatifolia*, with distinctly cordate bases and inconspicuous cystoliths on the upper surfaces, shorter petioles, the much shorter lobes of the staminate flowers, and the shorter segments of the perianth of the pistillate flowers.

Pilea pennellii Killip, sp. nov.

Plants monoecious, slender, branching near the base, 25 to 30 cm. high, glabrous throughout. Stipules triangular, barely 1 mm. long, acute. Petioles 5 to 8 mm. long, those of a pair slightly unequal. Leaf blades narrowly ovate-oblong, 2 to 3 cm. long, 0.8 to 1.5 cm. wide, acuminate at apex, tapering at base, minutely serrulate (teeth acute, imbricate, often cartilaginous at margin), 3-nerved (lateral nerves reaching to the upper quarter of the blade), light green on both surfaces, above copiously covered with punctiform and very minute linear cystoliths, beneath punctate with dark ocellae but almost destitute of cystoliths. Staminate heads globose, 5 to 6 mm. in diameter, purplish white, borne on slender peduncles 3 cm. long, the perianth lobes barely 0.1 mm. long. Pistillate flowers in closely flowered cymes, subsessile or with peduncles up to 3 mm. long, the segments unequal, the middle 0.7 mm. long, the lateral 0.4 mm.; achenes ovate, 0.5 mm. long.

Type in the U. S. National Herbarium, no. 1,140,923, collected in a forest along the Río San Rafael, below Cerro Tatamá Department of Caldas, Colombia, altitude 2,200 to 2,500 meters, September 7 to 11, 1922, by F. W. Pennell (no. 10326).

This species apparently is nearest *P. flexuosa* Wedd., differing in its smaller, closely serrulate leaves, and in its cystoliths. The light green aspect of the plant suggests *P. cuprea* Krause, but in that species the pistillate heads as well as the staminate are long-peduncled.

Pilea rhombifolia Killip, sp. nov.

Plants 20 to 30 cm. high, glabrous throughout. Stipules ovate, 2 to 3 mm. long. Petioles 0.5 to 1.5 cm. long. Leaves of a node similar in shape, subequal in size, rhombic or broadly ovate, 2 to 4.5 cm. long, 1.5 to 3 cm. wide, short-acuminate at apex, cuneate or subrotund at base, crenate-serrate above the base (6 to 7 teeth on a side), 3-nerved (nerves reaching to upper third of blade), subcoriaceous, dark green, slightly lustrous above, silvery-white beneath, copiously covered on upper surface with linear and fusiform cystoliths on lower surface confined mainly to the nerves. Pistillate head in cymes 1 cm. wide or less, the peduncles 0.5 to 1 cm. long; schenes ovate, 1 mm. long.

Type in the U. S. National Herbarium, no. 533,540, collected near Santa Marta, Colombia, altitude 1,750 meters, by H. H. Smith (no. 1446). A specimen of this collection is also in the herbarium of the Academy of Natural Sciences, Philadelphia.

This species is allied to *P. sessiliflora* Wedd. and *P. radicans* Wedd., differing from the former in its relatively broader leaves with larger teeth and more abundant cystoliths, and from the latter in its larger, thicker leaves and erect habit.

Pilea purpurea Killip, sp. nov.

Stems erect, 40 to 60 cm. high, angulate, glabrous below, slightly pubescent above. Petioles 1.5 to 3 cm. long, ferruginous-tomentose, becoming glabrate.

Leaf blades ovate or oblong, 8 to 12 cm. long, 4 to 5 cm. wide, acuminate (acumen 1 cm. long), rounded at base, finely serrate (teeth obtuse), 3-nerved to apex (nerves depressed on upper surface, with numerous pairs of parallel secondary nerves along each primary nerve), the upper surface dark green, glabrous, bearing faint linear cystoliths, the lower surface paler, densely tomentulous on the nerves and veins, destitute of cystoliths but conspicuously punctate between the veins. Staminate cymes up to 15 cm. long, borne in pairs in the axils of the upper leaves, profusely dichotomous, the peduncles and branches densely tomentulous; bracts unusually large for the genus, white; calyx globose, 1 mm. in diameter, white proximally, dark purple distally, its lobes minute. Pistillate cymes subsessile in the axils of the lower leaves, shorter than the petioles; middle segment of perianth obovate, 1.5 mm. long, the lateral segments broadly ovate, 1 mm. long; achenes broadly ovate, 2 mm. long, the margin thickened.

Type in the U. S. National Herbarium, no. 1,140,930, collected in a moist forest along the Río San Rafael, below Cerro Tatamá, Department of Caldas, Colombia, altitude 2,600 to 2,800 meters, September 7 to 11, 1922, by F. W. Pennell (no. 10380).

This is allied to *P. hirsuta* Wedd., differing chiefly in its larger staminate and smaller pistillate inflorescences, in the prominent bracts subtending the staminate flowers, and in the closer serrations of the leaves.

Pilea tatamensis Killip, sp. nov.

Plants dioecious. Stem. repent, at length erect, simple or branching toward the summit, hirsute throughout. Stipules ovate-lanceolate, 7 to 9 mm. long. Leaf blades flat or often slightly rugose, sharply serrate (teeth 2 mm. long), triplinerved (lateral nerves originating 3 to 4 mm. above base and extending to upper third of blade), the upper surface dark green, glabrous, bearing (except along nerves and veins) minute linear cystoliths, beneath paler, densely appressed-hirsute on the nerves and veins, sparsely hirsute elsewhere, the cystoliths fewer and less conspicuous than on upper surface; leaves of a pair unequal and slightly dissimilar, the larger ovate or elliptic-ovate, 3 to 6 cm. long, 2 to 2.5 cm. wide, acute at apex, obliquely cuneate at base, the smaller ovate, 2 to 3 cm. long, 1 to 1.5 cm. wide, rounded or subacute at apex, rounded or subcuneate and oblique at base. Staminate heads globose, 1 cm. in diameter, pilosulous, densely flowered, the peduncles 1 to 1.5 cm. long, hirsute; calyx lobes filiform, 2 to 2.5 mm. long. Pistillate heads cymose, 1 to 1.5 cm. broad, glabrescent, the peduncles longer than the petioles; achenes ovate, 1 mm. long.

Type in the U. S. National Herbarium, no. 1,140,928, collected in moist forest along the Río San Rafael, below Cerro Tatamá, Department of Caldas, Colombia, altitude 2,600 to 2,800 meters, September 7 to 11, 1922, by F. W. Pennell (no. 10378; staminate plants). The pistillate plants are represented by Pennell 10375 (U. S. Nat. Herb. 1,140,925).

In habit and general aspect this plant resembles *P. fallax* Wedd. It is differentiated by larger leaves with two well-marked lateral nerves, by the arrangement of the cystoliths, by longer peduncles, and by the more elongate lobes of the staminate flowers. Since the leaves at a node are not conspicuously unequal, the species should probably be referred to the section containing the long-peduncled pubescent species. The globose staminate heads suggest

P. mollis Wedd., though it is readily distinguished from that species by its shorter, more deeply cut leaves, its shorter peduncles, and the elongate lobes of the staminate flowers.

Pilea obetiaefolia Killip, sp. nov.

Plants monoecious (?), erect, herbaceous, about 30 cm. high; stems glabrous or the younger branches sparingly hirsutulous. Stipules ovate-lanceolate, 8 mm. long, 3 mm. broad, hyaline at margin, copiously covered with fusiform cystoliths on the outer surface. Petioles hirsutulous. Leaf blades oblong-lanceolate, short-acuminate at apex, subcuneate or rounded at base, crenate-serrate (teeth obtuse, 20 to 25 on a side), penninerved, dark green above, yellowish green beneath, bearing fusiform cystoliths on both surfaces; leaves of a pair similar in shape but slightly unequal in size, the larger 7 to 10 cm. long, 2 to 4 cm. wide, with petioles 3 to 4 cm. long, the smaller 5 to 8 cm. long, 2 to 2.5 cm. wide, with petioles 1.5 to 2 cm. long. Pistillate flowers borne in compact cymes 6 to 7 mm. wide on peduncles 5 to 6 mm. long; achenes broadly ovate, 2 mm. long, obtuse.

Type in the U. S. National Herbarium, no. 1,140,924, collected in a moist forest along the Río San Rafael, below Cerro Tatamá, Department of Caldas, Colombia, altitude 2,600 to 2,800 meters, September 7 to 11, 1922, by F. W. Pennell (no. 10374).

The species is characterized by large penninerved leaves similar to those of the genus *Obetia*. Its exact relationship to other species of *Pilea* is difficult to determine. The difference in size of the leaves at a node is not sufficiently great to refer it to the section *Heterophyllae*, while the pubescence of the stem and petioles, though slight, excludes it from the section containing glabrous species. Probably it is best placed in the section *Pubescentes Brevipedunculatae*, where apparently it is the only species with penninerved leaves.

Boehmeria coriacea Killip, sp. nov.

Suffrutescent, 40 to 50 cm. high, dioecious; stems woody toward base, strigose and hispidulous, becoming glabrate. Stipules ovate-lanceolate, 4 to 5 mm. long, acute. Petioles 0.5 to 1.5 cm. long. Leaf blades ovate or elliptic-ovate (the alternate leaves very unequal, the larger 5 to 9 cm. long, 3 to 4 cm. wide, the smaller 1.5 to 2.5 cm. long, 1 to 2 cm. wide), acuminate at apex, cuneate or subrotund at base, 3-nerved (lateral nerves extending to upper third of blade, a secondary pair of nerves reaching to apex), serrate (teeth acutish), thick, coriaceous, strongly rugose-bullate, above silvery gray and glabrous, beneath green, densely appressed-strigose on the nerves and veins and hispidulous. Staminate plants not seen. Pistillate flowers in axillary glomerules 5 to 9 mm. wide; perianth broadly ovoid, 1 mm. long, 0.8 mm. in diameter, sparingly strigillous; style 1.2 mm. long, densely hirsute; achenes orbicular, slightly wing-margined toward apex, acute at both ends.

Type in the U. S. National Herbarium, no. 1,140,931, collected in moist forest along the Río San Rafael, below Cerro Tatamá, Department of Caldas, Colombia, altitude 2,600 to 2,800 meters, September 7 to 11, 1922, by F. W. Pennell (no. 10381).

Boehmeria coriacea is distinguished from its nearest ally, *B. celtidifolia* H. B. K., by its broader leaves with glabrous upper surface and shorter, more nearly globose pistillate flowers. *Boehmeria celtidifolia* is a shrub, while *B. coriacea* is herbaceous.

Boehmeria arbuscula Killip, sp. nov.

Small tree, 3 to 4 meters high, monoecious; young branches angulate, slighty corky, closely appressed-pubescent. Stipules narrowly linear-lanceolate, 3 mm. long. Petioles 2 to 7 mm. long, appressed-pubescent. Leaf blades elliptic-ovate or slightly oblong (the alternate leaves unequal, the larger 1.5 to 3 cm. long, 0.8 to 1.5 cm. wide, the smaller 0.4 to 0.8 cm. long, 0.2 to 0.4 cm. wide), acuminate at apex, cuneate at base, 3-nerved (the lateral nerves extending to the upper third of blade), sharply serrulate, the upper surface dark green, plane or often rugulose, strigillous, with short stiff pellucid hairs, the under surface paler, appressed hirtellous, especially on nerves and veins. Flowers in compact axillary androgynous or unisexual clusters 3 to 4 mm. in diameter. Staminate flowers depressed-globose, 7 mm. wide, strigillous without. Pistillate flowers narrowly lanceolate, about 1.4 mm. long, densely hirsute without; style 0.8 mm. long, hirsute at apex.

Type in the U. S. National Herbarium, no. 1,140,085, collected in thicket near Coconuco, Department of El Cauca Colombia, altitude 2,300 meters, June 17, 1922, by E. P. Killip (no. 6831).

This is probably allied to *B. excelsa* Wedd., a tree known only from Juan Fernández. That species, however, has much larger leaves, hoary white beneath, larger flower clusters, and much longer styles.

Phenax grossecrenatus Killip, sp. nov.

Shrub, 2 to 2.5 meters high; branches sparsely hirsute, at length glabrate. Stipules ovate-lanceolate, 4 to 5 mm. long. Petioles slender, 2 to 5 cm. long, glabrous or sparingly pubescent. Leaves ovate or ovate-lanceolate, 6 to 12 cm. long, 3 to 6 cm. wide, acute at apex, rounded or subcuneate at base, coarsely crenate (teeth 5 to 7 mm. broad, rounded, 10 to 14 on each side), 3-nerved to the upper third of blade, above glabrous except on the tomentulous nerves, beneath minutely pubescent. Flowers in compact axillary androgynous clusters. Staminate flowers few, the lobes 0.5 mm. long. Style 3 to 4 mm. long, minutely pubescent with hooked hairs. Achene ovate, 1 mm. long, sparsely pubescent.

Type in the U. S. National Herbarium, no. 1,140,083, collected at edge of forest, near "Canaan," on the slopes of Mt. Puracé, Department of El Cauca, Colombia, altitude 3,200 meters, June 13, 1922, by F. W. Pennell and E. P. Killip (no. 6680).

Allied to *P. laxiflorus* Wedd., of Peru, this species differs in having larger, longer-petioled leaves, longer stipules, and larger androgynous flower clusters.

SCIENTIFIC NOTES AND NEWS

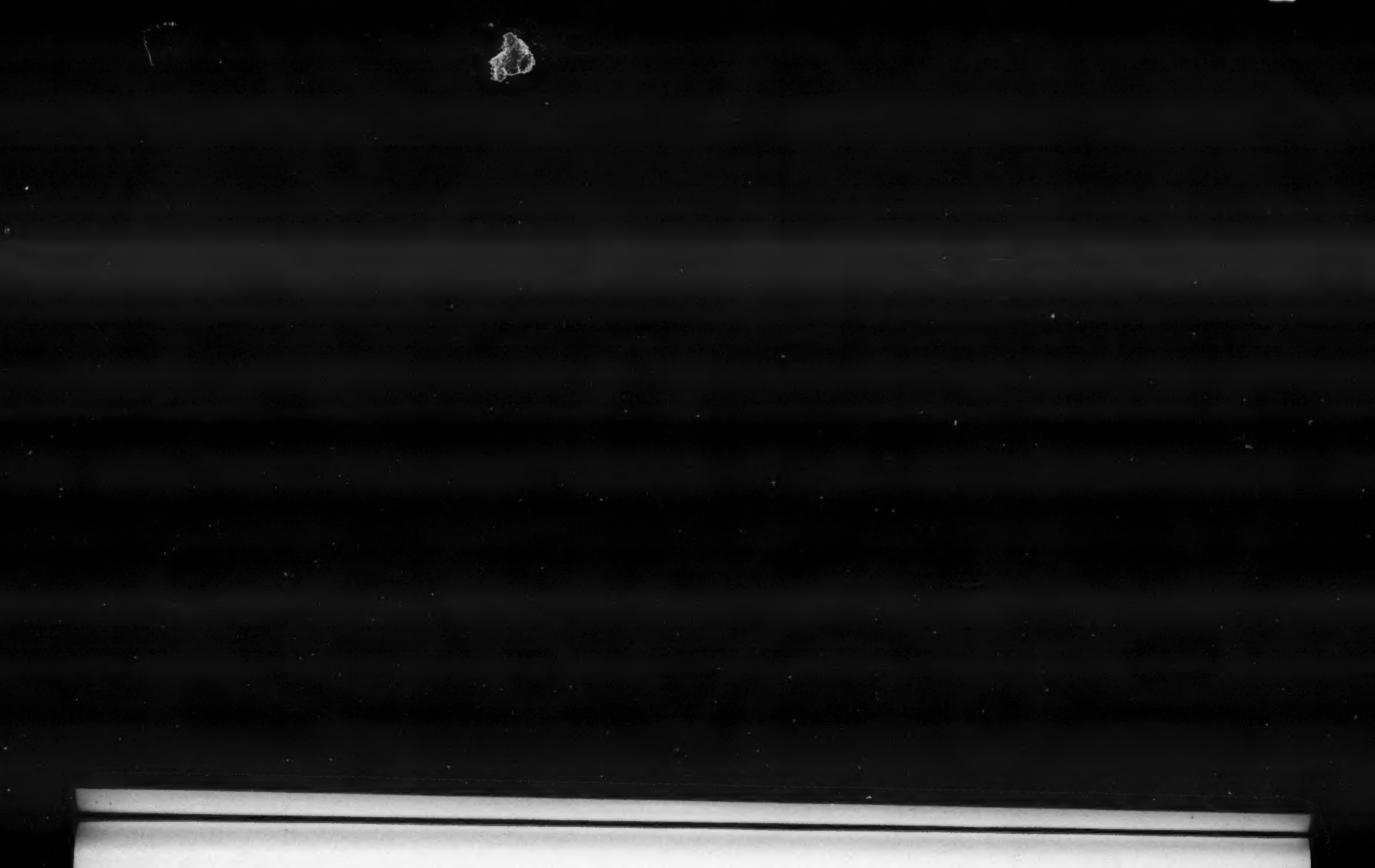
Dr. T. WAYLAND VAUGHAN, geologist of the U. S. Geological Survey, has been appointed Director of the Scripps Institute for Biologic Research of the University of California, and will assume actual charge of the work at La Jolla, California, early in 1924.

J. S. BROWN, assistant geologist in the Geological Survey, has accepted a position for one year in the Department of Geology, Missouri School of Mines, Rolla, Missouri.

Dr. L. W. STEPHENSON, Geologist in Charge of the Section of Coastal Plain Investigation of the Geological Survey, is conducting private stratigraphic work for an oil company in Venezuela. He will be absent from the Survey for six or seven months.

Professor THOMPSON BROOKE MAURY died on July 15, 1923, in New York City. He was born in 1838 in Fredericksburg, Virginia. He was well known locally because of his long connection with the Weather Bureau and his association with the late Dr. Cleveland Abbe.

Dr. RAPHAEL PUMPELLY, well known geologist, died at Newport, Rhode Island, on August 10, 1923, in his eighty-sixth year. He was born at Owego, New York, in 1837. After being professor of mining geology at Harvard from 1866 to 1875, he was a divisional chief in the U. S. Geological Survey. More recently under the auspices of the Carnegie Institution of Washington Dr. PUMPELLY directed a physical, geographical, and archeological exploration of central Asia. He was a member of many scientific societies, including the National Academy of Sciences.

O. F. COOK, Bureau of Plant Industry, and a party of botanists, including WILLIAM R. MAXON, of the National Museum, recently returned from Central America and the West Indies, where they have been investigating the sources of crude rubber with the purpose of increasing its production in tropical America. Several weeks were spent in Panama, Costa Rica, Nicaragua, and Haiti.

Dr. KARL F. KELLERMAN, associate chief of the Bureau of Plant Industry, received the degree of Doctor of Science at the commencement of the Kansas State Agricultural College.